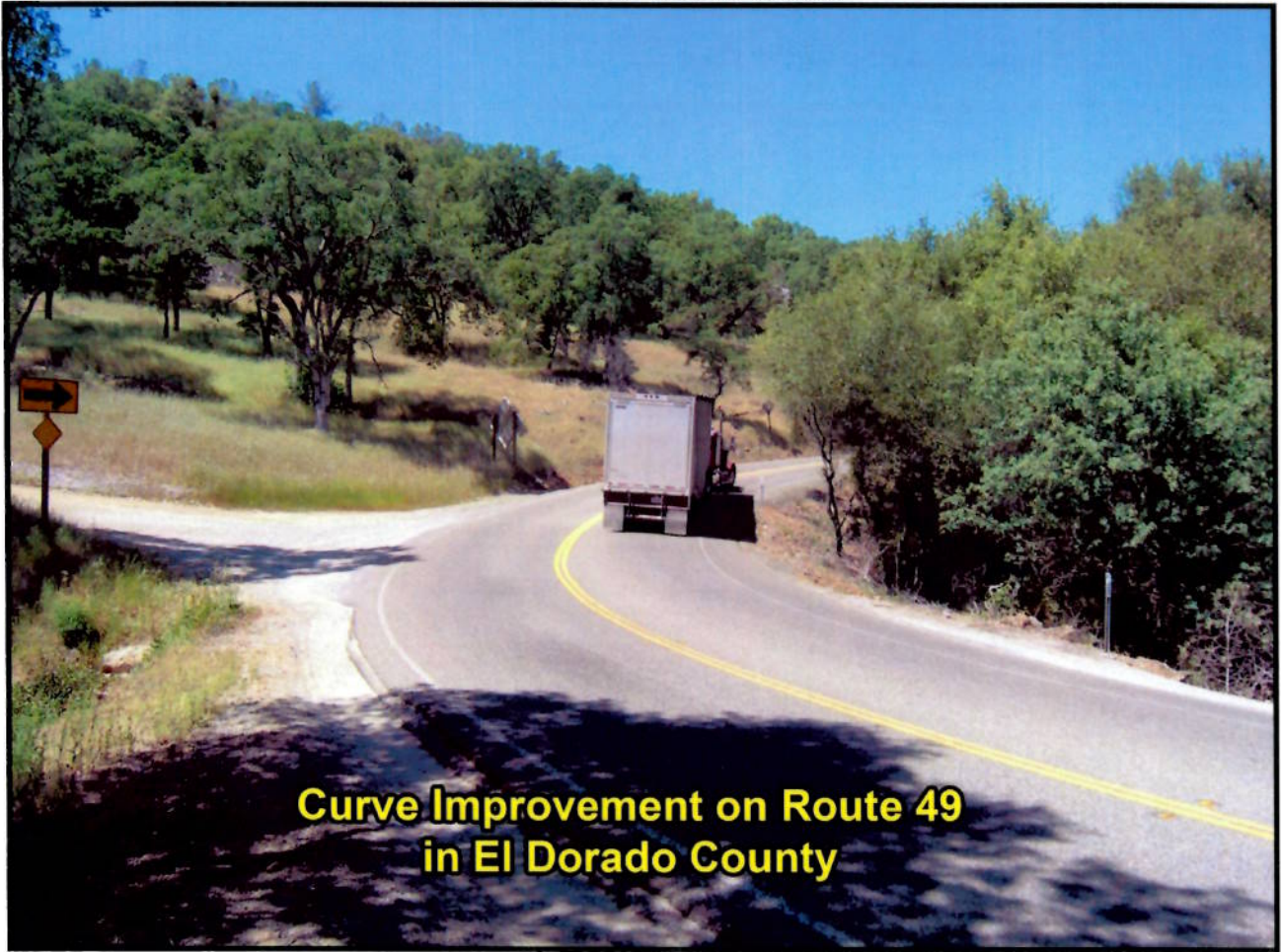


## PROJECT REPORT



### Curve Improvement on Route 49 in El Dorado County

*I have reviewed the right of way information contained in this Draft Project Report and the Right of Way Data Sheet attached hereto, and find the data to be complete, current and accurate:*

*Brenda L. Schimpf*  
BRENDA L. SCHIMPF, PMP CHIEF, NORTH REGION RIGHT OF WAY

#### APPROVAL RECOMMENDED:

*Clark A. Peri*  
CLARK A. PERI, PROJECT MANAGER

*Mike Hagen*  
MIKE HAGEN, PROGRAM ADVISOR

#### APPROVED:

*Jody Jones*  
JODY JONES, DISTRICT DIRECTOR

*12/19/11*  
DATE

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This Project Report has been prepared under the direction of the following registered civil engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

EA 03-4E5900

Curve Improvement

03-ED-49 PM 3.76-3.92

Project ID 03 0000 0711



  
DONALD C. RUSHTON, PE

2011 Dec 12  
DATE

# **ED-49, Curve Improvement**

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## **INTRODUCTION**

This project proposes to improve safety by replacing a compound curve with a single radius curve, widening the lanes and shoulders, and removing trees to improve sight distance along State Route (SR) 49 in El Dorado County from post mile (PM) 3.76 to PM 3.92. The project has been amended in the 2010 SHOPP for funding in the 12/13 FY. This project has a calculated Safety Index of over 200, which qualifies it as a 201.010 safety project under the Highway Safety Improvement Program guidelines at an estimated capital cost of \$1,570,000. North Region Environmental Planning has prepared a Mitigated Negative Declaration and a Categorical Exclusion for the project, and a small amount of undeveloped right of way will be acquired. Therefore, the Project Development Procedures Manual places the project in Category 4B.

## **RECOMMENDATION**

Caltrans should approve the Project Report and proceed to the PS&E phase of work.

## **BACKGROUND**

### **Existing Facility**

In El Dorado County, SR 49 is primarily a two lane rural road traversing north-south. The terrain is rolling to mountainous and wooded with the occasional meadow. In the project vicinity, lanes are 10.5 to 12 ft wide and shoulders vary in width from 1 ft to 4 ft. At the project location, the roadway makes a sharp curve to the east, with superelevation ranging from 2% to 10%. A private unpaved road, Ramales Lane (formerly Mica Street), forms a “T” intersection at the middle of the curve to the outside. A large grove of trees lies within the inside of the curve, compromising sight distance for both directions of travel.

This sharp curve is compound with radii of approximately 140 ft and 225 ft, the smaller radius being the southerly curve. A W8-5 “slippery when wet” sign and a W1-1a “curve ahead” with advisory speed (20 mph) sign alert drivers to the curve in the southbound direction. A W1-1 “curve ahead” sign with a W13-1 advisory speed (20 mph) sign indicate the approaching curve to northbound traffic, with a W1-6 arrow sign and an OM1-3 warning marker posted on the outside of the curve. The curve sign facing southbound traffic is larger than the sign facing northbound traffic (72 inches versus 30 inches).

Within the project limits, SR 49 traverses a sidehill, with cut slopes (0.75:1(h:v) and flatter) along the western side of the roadway and fill slopes (1.5:1 and flatter) along the eastern side. An unnamed seasonal stream passes through a 90-inch diameter Structural Steel Plate Pipe (SSP) cross culvert just south of Ramales Lane. Two smaller corrugated metal pipe (CMP) culverts cross SR 49 and Ramales Lane.

### **Project History**

There have been a number of run off road collisions in this area, predominantly by southbound traffic, with the majority of these collisions involving injuries. Curve warning signs with 20 mph advisories are present on both the northbound and southbound approaches



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to the curve. In response to the high collision rate at this location, in February, 2003, the curve warning sign facing southbound traffic was enlarged from 30 inches to 72 inches. Despite this improvement, the location appeared in the 2005 Run Off Road Report, warranting further action to reduce collisions.

### NEED AND PURPOSE

Addressing a common pattern of collisions, this project proposes to improve safety by:

- Eliminating the compound curve by constructing a single radius curve;
- Widening shoulders to improve recovery room;
- Improving sight distance by removing trees along the inside of the curve.

### Problem, Deficiencies, Justification

The project location has a history of run off road collisions, primarily by southbound vehicles, the majority involving motorcycles and injury related. The typical pattern for a collision is a single vehicle leaving the roadway and colliding with the steep cut bank on the outside of the compound curve. These collisions occur after vehicles have entered the sharper curve, indicating that vehicles are entering the compound curve too fast.

Wheel tracks have scoured away existing vegetation in a large dirt area on the cut slope, providing evidence of the run off the road collisions. The presence of multiple tire tracks indicates that the collision rate for this location may be higher than the recorded data reflects due to drivers of lightly damaged or undamaged vehicles leaving after a collision and not filing a report.



**Figure 1:**  
View looking south  
from Rmales Lane,  
showing southern cut  
bank and evidence of  
run off road collisions  
along cut slope.

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The trees on the inside of the curve impair sight distance, possibly a contributing collision factor. Motorists entering the curve cannot see the far side of the curve, and it is not immediately evident that the curve is compound. For southbound traffic, the initial curve radius (225 ft) is suitable for a greater speed than the advisory 20 mph, but the second curve radius (140 ft) is not. Because the far side of the curve is obscured, the initial impression to southbound drivers is that a vehicle can enter the curve at a greater speed than the advisory speed, resulting in motorists losing control after entering the second, sharper curve.



**Figure 2:**

**Southbound driver's view from about station 17+00. The degree of curvature and southern cut slope are hidden by the trees lining the inside of the curve. Ramales Lane is visible just beyond the curve warning sign.**

The narrow lanes and shoulders, combined with the small curve radius also cause truck off-tracking issues. The rear wheels of northbound truck trailers travel off the paved shoulder, creating deep ruts in the dirt. Southbound truckers also drive off the right shoulder to keep their trailers from off-tracking across the centerline, creating ruts outside the right shoulder as well.

### **Regional and System Planning**

Classified a Minor Arterial in District 3's Transportation Concept Report (September 2000), SR 49 in the project vicinity is not on the National Highway System, nor is it on the Freeway and Expressway system. Transportation Concept Improvements are to widen to 40-foot standard where possible. This project does not preclude further improvements to meet system planning.

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### **ALTERNATIVES**

There are two alternatives for this project. Caltrans should implement the Preferred Alternative, Alternative 1, as described in this report.

#### **Preferred Alternative**

##### **ALTERNATIVE 1: Eliminate Compound Curve and Widen Roadway**

This alternative:

- Replaces the compound curve with a single 190 ft radius curve;
- Widens travel lanes to 12 ft and shoulders to 4 ft, respectively;
- Removes trees along the inside of the curve to improve sight distance and visibility of the curve

Modification of the existing drainage systems is necessary to eliminate the compound curve and widen the roadway. This will involve extending an existing 90-inch SSP culvert and constructing a rock-lined outfall channel, replacing a 12-inch CMP culvert with an 18-inch alternative pipe culvert (APC) and drainage inlet, realigning an 18-inch CMP culvert, and adding two new drainage inlets along Ramales Lane.

Due to geotechnical considerations, the lanes and western shoulder will not be widened north of Ramales Lane to avoid disturbing a potentially unstable cut slope. Because the shoulder width is narrow, the roadside ditch will be paved to provide smooth additional recovery area.

This alternative provides additional recovery room for errant vehicles and reduces the likelihood of future run off road collisions at this location, and is therefore the Preferred Alternative.

Attachment A shows the project location and Title Sheet for the project. Attachments B and C present the typical cross sections and layout respectively.

#### **Rejected Alternatives**

##### **ALTERNATIVE 2: No Build**

This alternative would leave the roadway in its current state. This alternative does not take action to reduce collisions at this location, and is therefore rejected.

### **CONSIDERATIONS**

#### **Environmental Issues**

A Mitigated Negative Declaration has been prepared pursuant to the California Environmental Quality Act (CEQA) and a Categorical Exclusion has been prepared pursuant to the National Environmental Policy Act (NEPA). The attached Mitigated Negative Declaration and Categorical Exclusion are the appropriate documents for the proposal.

Attachment E includes the Mitigated Negative Declaration and the Categorical Exclusion. The Initial Study is attached as a separate document.

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Caltrans conducted a public information workshop on June 23, 2011 at Diamond Springs. During the public circulation period, Caltrans received six comments. In general, the comments discussed the tree removal and the large culvert extension.

The culvert extension comments raised the potential use of the 90-inch culvert as an animal passage. Caltrans has no evidence confirming or refuting that animals currently use the culvert as a highway crossing. Caltrans changed the project slightly to minimize impacts to the culvert's use as an animal passage.

### Permits:

Permits will be needed from the following agencies:

<u>Agency</u>	<u>Permit</u>
California Department of Fish and Game	1602 Lake and Streambed Alteration Agreement
Regional Water Quality Control Board	401 Water Quality Certification
US Army Corps of Engineers	404 Nationwide Non-Reporting Permit

### Visual:

The project will remove several oak and pine trees, particularly on the inside of the curve. The Mitigated Negative Declaration concludes the project will not have a significant adverse effect on visual resources because shrubs and trees will be planted within Caltrans' right of way where feasible. The trees will be planted outside the clear recovery zone and where at maturity they will not obscure sight distance. Shrub varieties will be selected to be no more than 6 feet tall and have trunks no more than 4 inches in diameter at maturity.

### Erosion Control:

New cut and fill slopes are required to realign and widen the roadway. Much of the existing terrain in the project location is rocky, which should result in stable slopes. Slopes will be revegetated with native grasses, plants, and trees where feasible.

### Hazardous Waste:

Asbestos-bearing rock is not known to be present within the project limits. Both yellow and white paint/thermoplastic stripes may contain hazardous levels of lead and/or chromium, which may require special handling when removed. Aerially Deposited Lead may be present along the highway. However, based on the rural location of the project, the soil generated from excavation does not require special soil handling and may be reused on site as non-hazardous soil.

The Initial Site Assessment is included in Attachment F.

### **Right of Way**

Construction of the new cut slopes will require both fee acquisitions and temporary construction easements. Fee acquisition area is also required along the inside of the curve for removal of trees to establish sight distance. Additional fee acquisition is proposed for visual mitigation on site.

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The Right of Way Data Sheet is included in Attachment G.

### **Geotechnical Report**

A Preliminary Geotechnical Report evaluated the existing cut and fill slopes and provided new slope recommendations. Analysis of the existing soil conditions indicates that the southern cut slope is stable and may be excavated to the same or steeper angle. The report suggests that while the material may not be rippable, blasting should be avoided, and other excavating techniques, such as hydraulic splitters, hoe-rams, and chemical expanders, should be considered. A hillside to the north consists of highly fractured rock and is less stable; however, no excavation is proposed for this location. To avoid disturbing this slope, the lanes and shoulder along the slope will not be widened.

Fill slopes vary, but will generally be 2:1(h:v) or flatter. Approval for construction of these slopes was obtained from Maintenance and the Landscape Architect.

The report recommends further investigations during the final design phase.

See Attachment I for the Preliminary Geotechnical Report and Attachment J for the Slope Approval Forms.

### **Hydraulics**

The project requires modification of three culvert systems and modification of the roadside ditches:

- The 90-inch SSP culvert will be extended on its current alignment approximately 25 ft on the downstream side. The culvert will daylight in the fill slope and a rock-lined channel will convey the discharge from the pipe outlet to the existing streambed. The project will extend the inlet approximately 2 ft upstream and construct a headwall with a rock-lined inlet basin. The invert of the pipe will receive a concrete lining with cobble placed to mimic a natural stream bottom. This represents a change from the improvements proposed in the Draft Project Report. In the original proposal, the culvert extension included a bend in both the horizontal and vertical alignments and was long enough to discharge in the streambed. Comments at the public workshop triggered this design change. (See “Environmental Issues” earlier in this section.) This culvert appears to have been sized for use as a stock animal crossing tunnel, as the culvert is oversized for the existing flow volumes. Lengthening the culvert and lining its invert will not adversely impact the pipe’s ability to carry 100-year flood flows.
- The existing 18-inch CMP culvert crossing Ramales Lane will be realigned and lengthened to conform to a new flowline created by the roadway widening. Two drainage inlets will be placed on either side of Ramales Lane to intercept runoff from the private road. This culvert will still discharge upstream of the 90-inch culvert.
- The 12-inch CMP culvert crossing SR 49 toward the project’s north end has a damaged inlet and is smaller than recommended in Topic 828.2 of the *Highway Design Manual (6th Ed.)*. Upgrading the culvert to an 18-inch CMP culvert will require lowering the culvert flow line to provide adequate cover. A drainage inlet will be installed at the culvert inlet to permit lowering of the culvert flow line.



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The roadside channels will be paved to provide support for the roadway structural section and a smooth surface for extra recovery width for errant motorists. These changes will not decrease the ability of the drainage systems to convey anticipated flows, although increased channel velocities will result.

See Attachment K for the Preliminary Drainage Report.

### **Traffic**

Traffic Volumes:

Traffic data for SR 49 at this location is as follows:

Location	Post Mile	AADT			
		2010	2014	2024	2034
ED-49	3.8-3.9	3,800	4,180	5,130	6,080

Collision History:

The collision history at the project location for the five-year period from April 1, 2004 to March 31, 2009 is summarized in the tables below:

Location PM	Total Number of Collisions	Fatal	Fatal + Injury
3.76-3.92	12	0	9

Actual Rates (per million vehicles)			Average Rates (per million vehicles)		
Fatal	Fatal + Injury	Total (all collisions reported)	Fatal	Fatal + Injury	Total (all collisions reported)
0.000	2.48	3.31	0.032	0.62	1.34

Four (25%) of the twelve collisions involved wet roads, and eleven involved a single southbound vehicle.

The proposed safety improvements in this project will reduce the collision rate by better meeting driver expectation, providing more recovery room for vehicles, and increasing the visibility of the curve.

Traffic Management Plan:

Traffic volumes at this location are low enough that daytime lane closures are permitted, with a minimum of one 12 ft lane open for use under one-way traffic control. The TMP estimates a cost of \$2,625/day for Traffic Management Plan items. Construction Zone Enhanced Enforcement Program (COZEEP) is estimated at \$1,000/day during daylight hours and \$2,000/day during nighttime hours whenever CHP involvement is needed during construction. In addition, the TMP estimates a lump sum of \$5,000 for public information.

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No practical traffic detours exist, and all traffic, including non-motorized, will be mixed flow during construction.

See Attachment M for all traffic information.

### **Non-standard Design Features and Design Exceptions**

Two features of the existing roadway, the longitudinal roadway grade and the vertical curve length, do not meet the Mandatory and Advisory standards in the Highway Design Manual (6th Ed) and are not being upgraded in this project. The longitudinal roadway grade is as steep as 9.7%, which exceeds the maximum value of 7% for rural highways in mountainous terrain. Three vertical curves at the northern end of the project are each 100 ft long, which is less than the 200-500 ft curves required per Topic 204.4 of the Highway Design Manual.

Reconstruction of the roadway's vertical curvature and longitudinal grade are beyond the scope of the project. Heidi Sykes, North Region Design Reviewer, and Shira Rajendra, Chief, Office of Design South, reviewed this project and determined that discussing the existing nonstandard features in the Draft Project Report and this Project Report is sufficient. John Steele, HQ Design Coordinator, agreed that no further documentation in a Fact Sheet is necessary.

Advisory Design Exceptions approved on November 19, 2009 document nonstandard superelevation transitions and side slopes steeper than 4:1(h:v). Mandatory Design Exceptions approved on November 24, 2009 document the nonstandard lane width north of Ramales Lane, nonstandard shoulder widths throughout the project limits, nonstandard stopping sight distance in a sag vertical curve, and construction of the new curve radius less than standard for the roadway design speed. Attachment D presents the Design Exception Fact Sheets.

## **PROJECT MILESTONES**

PA/ED (200)	12/15/11
RW Maps (224)	Complete
P&E (377)	6/15/12
RW Cert (410)	12/1/12
RTL (460)	12/15/12
Advert (480)	2/15/13
App cont (500)	6/15/13
CCA (600)	4/1/14

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### PROJECT PERSONNEL

Name	Responsibility	Phone
Don Rushton	Project Engineer	(530) 741-5740
Mike Hagen	Traffic Safety Chief	(530) 741-5712
Clark Peri	Project Manager	(916) 274-0538
Suzy Melim	Environmental Senior	(530) 741-4484
Jennifer Clark	Environmental Coordinator	(916) 274-0601
Kelley Nelson	Environmental Biologist	(530) 741-4583
Alicia Beyer	Hazardous Materials	(530) 741-4580
Monica Finn	Landscape Architecture	(916) 799-6285
Lee Ann Lambirth	Senior Right of Way Agent	(530) 741-5140
Karen Basra	Right of Way	(530) 741-4565
Luis Rivas	Area Construction Engineer	(530) 621-0985

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### **ATTACHMENTS**

- A. Title Sheet/Location Map
- B. Typical Cross Sections
- C. Layout
- D. Design Exception Fact Sheets
- E. Mitigated Negative Declaration and Categorical Exclusion (Initial Study attached as a separate document)
- F. Hazardous Waste Revised Initial Site Assessment
- G. Right of Way Data Sheet
- H. Landscape Architecture Assessment Sheet
- I. District Preliminary Geotechnical Report
- J. Slope Approval Forms
- K. Preliminary Drainage Report
- L. Storm Water Data Report
- M. Traffic Information
- N. Preliminary Cost Estimate
- O. Programming Sheet